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U. S. DEPARTMENT OF AGRICULTURE.

FARMERS' BULLETIN No. 72.

CATTLE RANGES OF THE SOUTHWEST:

A HISTORY OF THE EXHAUSTION OF THE PASTURAGE AND SUGGESTIONS FOR ITS RESTORATION.

BY

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF AGROSTOLOGY,
Washington, D. C., January 27, 1898.

SIR: I have the honor to transmit herewith and recommend for publication as a Farmers' Bulletin a report on the "Cattle ranges of the Southwest," by Mr. H. L. Bentley, special agent in charge of grass station at Abilene, Tex., which is essentially a history of the exhaustion of the pasturage of central Texas, with suggestions for its restoration. The general features of the country are described; the early conditions of the ranges and the causes which have led to their deterioration are graphically portrayed. The obstacles in the way of the improvement of the ranges and how the value of the stock ranges may be renewed are topics discussed in detail. The report closes with brief descriptions of a few of the most important native grasses and forage plants which may be utilized in improving the pasturage or increasing the production of forage. The matter here presented will be of interest to all who are engaged in the stock industry, not only in the Southwest but in every portion of this country where dependence is put upon the natural herbage for supporting sheep and cattle.

Respectfully,

F. LAMSON-SCRIBNER,
Agrostologist.

Hon. JAMES WILSON,
Secretary of Agriculture.

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CATTLE RANGES OF THE SOUTHWEST.

EARLY USE AND PRESENT CONDITION OF TEXAS PASTURES.

The purpose of this report is to invite the attention of stockmen and farmers of the Southwest to mistakes in dealing with native grasses and other forage plants and to offer for their guidance some suggestions based upon experience and observation.

A full and complete history of the stock industry of the whole of the Southwest can not be given at this time; but the condition of one of the richest sections of Texas, a region which has been actively engaged in this branch of agriculture for fully thirty-five years, may be taken to represent in detail the state of affairs over a much wider extent of territory. The lessons here learned may be made applicable to all sections where the native grasses are depended on to support herds of cattle and flocks of sheep. The dangers that confront Texas cattlemen and which must surely follow continued overstocking should serve as a warning to other similar pastoral regions.

CENTRAL TEXAS RANGES.

This portion of Texas includes all the counties of Stonewall, Haskell, Throckmorton, Fisher, Jones, Shackelford, Nolan, Taylor, Callahan, Runnels, Coleman, Tom Green, Concho, and McCulloch, and parts of the counties of Kent, Scurry, Mitchell, Coke, San Saba, Brown, Eastland, Stephens, and Young. It embraces a territory about 100 miles wide, east and west, and about 200 miles long, north and south.

The characteristics common to these counties are:

(1) An open country, in the main, with some black-jack, post-oak, and live-oak timber on the uplands and ridges.

(2) A scattering growth of mesquite trees on the lands away from the streams, which, together with the timber on the streams, furnish ample firewood and posts for fencing purposes.

(3) Numerous streams that furnish an abundance of "stock water," fringed along their banks with groves of pecan, elm, hackberry, wild china, cottonwood, and other trees.

(4) An altitude ranging from 1,500 to about 1,900 feet above the sea level.

(5) A climate pure and bracing.

(6) An annual rainfall of about 20 to 35 inches, the average being about 30 inches, so distributed through the year that it suffices for range purposes, but periodically not quite enough for the best results in farming.

(7) A temperature ranging from 90° to 102° down to 7° F.

(8) A rich alluvial soil in most of the valleys, while on the uplands there are loams generally containing a large admixture of calcareous marls, varying in color from a light gray through all the intermediate colors, chocolate, mulatto, red, and brown, to black, all productive and susceptible of high cultivation, and especially rich in all the essentials for the production of the cereals and grasses.

(9) A great variety of native forage plants and rich grasses.

Stonewall, Nolan, Mitchell, McCulloch, Coke, San Saba, and Taylor counties, by their mountains, level plains, and rolling prairies present a greater diversity of surface than the others. In Taylor County there are elevations of considerable altitude, one mountain range extending through it from southeast to northwest, the highest point being 519 feet above the surrounding plains. In Throckmorton, Stephens, Shackelford, Callahan, Runnels, Coleman, and Tom Green counties there are some broken areas. In the other ten counties named there are comparatively few hills and practically no mountains; the prevailing characteristic topography being the rolling or undulating prairies. In all of these counties where there are neither mountains nor hills, the general surface is gently undulating, except in the immediate vicinity of the streams, where it is rough and sometimes cut up by canyons.

EARLY CONDITION OF THE RANGES.

In 1865 large herds of buffaloes ranged almost undisturbed over this part of central Texas, and as late as 1876–77 small herds found their way in, to be quickly killed off by hunters and the pioneer stockmen. By that time herds of cattle and flocks of sheep had been located along the various water courses, but it was not until about 1883, when the Texas and Pacific Railroad first entered the section, that there was anything like systematic settlement of the country. Passing through parts of it in 1879, ranches were only to be found at long intervals. Ranchmen who located in Taylor and Jones counties about 1876 state that there were then scarcely 200 people in the two counties. All of these were engaged in stock raising, and had been attracted to the country by the abundance and luxuriance of the native grasses. It is interesting to late comers to listen to the description of the range as it then appeared. One can form but a poor idea of what this country was like twenty-five years ago, from its present appearance.

A stockman who traveled with a herd of cattle through San Saba, Tom Green, and Taylor counties in the summer of 1867, when that country was very sparsely settled, says that the grass was everywhere from 1 to 3 feet high, and that sometimes it was as high as a cow's

back, not only on the bottom lands, but also in places on the drier uplands. At that time there is little doubt that the ranges would have supported 300 head of cattle to the square mile. It was an ideal stock country. There was plenty of water, and the "nester," the man with the hoe, had not yet put in his appearance to dispute with the cattlemen the right and title to these boundless meadows. There were a few sheepmen scattered here and there along the drier uplands, where there was a shorter and richer growth of herbage. They were so few that they were tolerated by the cattlemen just because there was such a plethoric abundance of grass and water. True, the sheepman and the nester had just as good a legal right to the land, but then in Texas, as in other lands and other times, might was right, and the cattlemen ruled until organized law came in and took possession. So there was much talk of ownership of grass and water, or "range rights," although in point of fact there was probably not a single ranchman in the whole region who had legal title to an acre of the property so claimed.

Now, at the end of thirty years, almost every condition has changed. The carrying capacity of the range has steadily decreased until it is an exceptional property that can carry 1 head of stock to 5 acres. It is claimed that that was the common average rate ten years ago. To-day it requires at least 10 acres per head, and it is often considered not the best policy to put on more than 50 cows to the section of 640 acres.

In the early days there was such an abundance of grasses of so great variety that no one took time to note how many there were or which were the most valuable. There was more than enough to support every head of stock that could be crowded on the range. They were strictly first-class; stock fattened and kept fat on them, so what was the use of figuring on the varieties.

The idea that any of these grasses would ever become extinct, or that this golden period of fatness and plenty would come to an end, never entered the minds of those who were reaping the harvest. The experience of most of the stockmen of the Southwest has been alike. They have seen the range that originally might possibly have supported 500 cows to every 640 acres decrease in capacity to maintain stock until 10 to 12 acres to the cow is not an exceptional case, but the general rule. The reasons for these changes are not difficult to discover.

WHY THE CAPACITY OF THE RANGES HAS DECREASED.

Free grass.—The pioneer stockman in the section thought he had "struck it rich," as he had, and that there was not a sufficient number of cows in Texas to eat all the grass he saw growing in what is now called the Abilene country. There was no one in the country asserting any special claims to any particular lands. True, all or nearly all of the land had been located and surveyed, and belonged either to railroad companies, private individuals, counties, or to some of the State trust funds. But none of the legal owners were on the ground

in person, and there was nothing to prevent cowmen from appropriating the range, arbitrarily laying off their range boundaries, and claiming them under their so-called "range rights." The first cowman who located his ranch headquarters in one of the counties named claimed that his "range rights" included everything in sight. When cowman number two moved in, the two divided up the range and each one kept on his side of the division line agreed on between them. As other cowmen appeared, the range was still further divided until it was fully occupied. Moreover, it is due the stockmen referred to, to state that between them absolute good faith was maintained, each one recognizing the "range rights" of the others and not interfering with them. Really there was no need for one to crowd another. There was plenty and to spare for all, and they all recognized that, with "free grass" for all, the road to wealth was easy and certain.

Coming of the railroad and speculation.—About 1882, when the final survey for the Texas and Pacific Railroad was being made through that country, owners of the lands under consideration began to drop in with a view to looking up their properties. Then it was that the cowmen began first to realize that they could not depend much longer on "free grass." The result was a natural, indeed an inevitable, one. Every man was seized with the desire to make the most that was possible out of his opportunities while they lasted. He reasoned that there was more grass than his own cows could possibly eat. There was plenty of stock water for five times as many cows as were now on the range. There was no rent to pay, and not much in the way of taxes, and while these conditions lasted every stockman thought it well to avail himself of them. Therefore all bought cows to the full extent of their credit on a rising market and at high rates of interest. Not only were the cowmen of this section influenced by such ideas, but similar conditions obtained in other sections of the State, and indeed throughout the great stock regions of the West, Southwest, and Northwest. Nearly every stockman was in the market for more cows. Naturally this demand resulted in a constant upward tendency in the matter of prices until about 1883, when millions of cattle changed hands at from $20 to $25 per head, calves counted, range delivery.

The fever of speculation that first took possession of the cowmen spread throughout the United States, and even to Europe, until there were many more buyers than sellers. Old men, middle-aged men, and young men, representing every sphere of life, were eager to give up enterprises with which they were familiar to go into the "cow business." Every State in the United States was represented in the single State of Texas; and in every county in the State recognized as stock country, Englishmen, Scotchmen, and indeed men from most of the countries of Europe, were rushing to get a foothold, a "range right," and herds of cows to make them rich in a hurry, eating "free grass." In the meantime wool was going up in price, and so were sheep, and

when men were not able to purchase cows they took sheep, and soon the sheepmen were about as wild in their visions of wealth to be speedily acquired as were the cowmen. Those who bought cattle and sheep in 1882–83 have good reason to remember that $25 for a cow and from $5 to $6 for a sheep were not then regarded as being extravagant prices. No class of men could so readily figure out such happy results on paper as stockmen, and when anyone expressed doubt back in those flush times, as to the permanency of such prices, pencils and memorandum books promptly appeared, and it was explained to the doubter that cows were certain to go to $35, and even $50, and sheep to $10 per head. The demand for money to invest stiffened the backbones of those who had it to loan, until from 1½ to 2 per cent per month was unblushingly demanded and unhesitatingly given, not only upon stock but upon personal security.

Losses as a result of overstocking.—As a result of this madness, the range was overstocked, and a dozen cows and sheep were crowded on the "free grass," where half the number was too many. The ranges were quickly eaten and trampled out and permanently injured, if not ruined. A cowman was in the Fort Worth (Tex.) market in 1882, to sell his herd of cattle and his "range rights." He frankly admitted that he did not own a foot of the land he was using, but gravely insisted that his "range rights" embraced 100,000 acres, on which he was holding 25,000 head of cattle. He did not get his price, hence had to hold over his herd through the winter of 1882–83. It was an exceptionally severe one, and the following spring only about 10,000 head were rounded up. Still he was undismayed and was able to figure out, to his own satisfaction at least, how in the next two years or less he would make back all his losses and much more besides. On the 100,000 acres he was using he might have held 10,000 head of cattle safely, part of it being rough and much cut up with canyons; but in his eagerness to get rich fast he greatly overstocked the range, made no provision for winter feed, never thought it necessary to provide any sort of shelter for his stock, and suffered the inevitable consequences of this reckless way of doing business.

This man was but a type of his class, and there were thousands in Texas about that time who suffered as he did for precisely the same reasons. The general collapse came in 1884, when the stockman who was not financially ruined was the exception. By that time the range also was about ruined, and whereas ten years before its capacity for maintaining cattle was perhaps 500 cows to every square mile, this capacity had been diminished, as the result of bad management, until 10 acres to a cow were necessary.

Advent of the "nester."—With the railroad came the "nester," the man with the hoe; and with him came the owner, or his agent, of the lands up to that time held rent free by the cowman. Then followed disputes over land titles and boundary lines, and the end of the "range

rights" business was in sight. Stockmen who had "pulled through" the general wreck, realizing the necessity for procuring real, tangible rights to the range, went into the market to lease. When they were able to secure leases they did so, but, failing as to some of the surveys in their ranges, they nevertheless contended for the right to use them. Finding that they could not keep out others without fencing, they began to fence. This angered the "nester," who claimed the right to use in common with every one else the alternate school and other public sections which were not leased. This right being repudiated by those who had fenced these lands, fence-cutting began and increased until the legislature was compelled to enact the most stringent laws to put a stop to it. It was really like a fight over a crust, however. The best grass was gone, and with every class of stock a drug on the market at the lowest prices ever known in the history of the stock business, it was difficult for anyone to make stock-raising profitable. Such conditions served only to encourage the lessee to still further overstock the range. He was not, as a rule, the owner of the title. He realized that his tenure was both limited and uncertain, and, being in hard lines, his idea seems to have been to make the most of his opportunities while they lasted. Hence it was that he crowded into his pastures more stock than they could support, and in this way still further diminished their capacity for supporting stock.

PRESENT CONDITION OF THE RANGES.

This overstocking of the ranges has continued year after year, through good seasons and bad ones, until it is the opinion of some of the most experienced cowmen of central Texas that the injury has gone almost past the point where redemption is possible. The ranges have been almost ruined, and if not renewed will soon be past all hope of permanent improvement.

Not only have the ranges been overstocked, but the prairie dog and the jack rabbit have also been damaging the land until the best natural grass country in the United States has been almost destroyed. It is not yet too late to remedy the evil, but no time is to be lost. It is the common opinion that rest is all that is necessary to recuperate and bring back the former luxuriant vegetation of the ranges. But in part common opinion is here at fault. Resting the range will greatly help it, but something more must be done to bring it back to its original capacity for supporting stock, if, indeed, that is now possible. The people of Texas are not different from those of other States. They are all alike grass destroyers. Not only has the stockman been reckless in this direction, but even the farmer has been his ally. The latter still wages a war of extermination on the grasses he finds growing in and about his fields; and in his anxiety to make more room for cotton he ruthlessly breaks the sod, that if properly cared for could be made to pay him much better than cotton at 4 to 5 cents a pound.

OBSTACLES TO RENEWAL OR IMPROVEMENT OF THE RANGES.

That the range can be brought back to something like its original capacity is certain, but the difficulties in the way of accomplishing this are many, a few only of which will be enumerated:

LEASE OF LANDS.

Before a sick man can be induced to take medicine, he must be made to recognize that he is sick and that the prescription will in all probability benefit him. The cowman is, in a sense, a sick man, but strangely, in view of his experiences just mentioned, he seems not to recognize the fact in a practical way. He knows that he is not in as good shape financially as he was twenty years ago, but he still has a "good thing," according to his notion, and is still disposed to "crowd his luck," as he is in the habit of expressing it. He has, under protest, however, purchased from the railroad companies and from individuals a moiety of the lands inside of his pasture fences, and he is leasing from the State at a merely nominal price most of the others. He is not overstocking the pasture as recklessly now as he did in former years, but there is hardly one cowman out of ten in central Texas but knows that he has more cows on his range already, or is preparing to put more on, than his best judgment suggests. Why is this? Only about one-fourth or possibly one-half the lands in his pasture belong to him; the public lands may at any time be "filed on" by "actual settlers," and he may be compelled in a year, more or less, to pull down his fences and give way to the "nester." He is now paying something for the grass that is growing on the lands in his pasture, and while the opportunity lasts his idea seems to be to use it, not prudently as he would do if it were his own, but to get the good out of it while he can. In this he is acting strictly within his legal rights, and who has the right to complain? If anyone should suggest to him that his own lands are suffering also, his answer might be that when they shall cease to be valuable to him on account of their grass he will sell them to the farmer, who in his anxiety for cotton will be glad to have as little grass as possible to fight.

REVIVAL OF SPECULATION IN CATTLE.

During the past year there has been a revival in the cow business in all parts of the United States. The low price of cattle that followed as a necessary consequence on the heels of the general wreck of the business in 1884, when millions of cattle were forced on the market to pay debts, discouraged the raising of cattle for a time. This resulted in a shortage that has forced up prices. This rise in prices, due mainly to the fact that the supply has been less than the demand, has induced those still in the business to "stock up" their ranches. Thousands on the outside have also gone into the business. Recently fortunes have been quickly made by stockmen, and this fact, following closely on the

heels of the general business depression that has prevailed during the last few years all over the United States, has had a marked tendency toward the revival of the wild passion for speculation that obtained in the early eighties. One would naturally suppose that the old-time cowman, who went "through the fire" in those days, would be very conservative now, but such does not appear to be the case. He seems to feel that as he "played in bad luck" then, now that he has the chance again, he must win back his losses. Hence it is that these men are again in the market as buyers, and now many of them are as reckless in their speculations as they were when everybody was a speculator.

ONE INSTANCE OF SUCCESS AND FAILURE.

"A burnt child ought to dread the fire," but when this and that man are known to have cleared large sums in the cattle trade, others with the feverish desire to become suddenly rich have no doubt of their ability to make equally large profits. As an example, there is a Southern cowman who, in 1883, was reputed to be a millionaire. In 1885 he was rated at not above $50,000; later he came to be recognized as practically insolvent. During the past ten years he has been "hard pressed," until recently. Since the first of January, 1897, he has been in the market again, purchasing "every thing in sight," and paying, or agreeing to pay, top prices for all classes of cattle. Things "have come his way" and again he is a rich man. He could retire now and have enough property in hand to satisfy the desires of most men. But he aspires to be once more a millionaire, and will doubtless risk everything he has or shall have, over and over again, to gain his point. Such instances are not rare in the Southwest, and the tendency has been and will be to encourage other and less experienced men to take like risks. This situation means, and will continue to mean for a while, a still further overstocking of the ranges in order that the ranchmen may be able, for the time being, to make the most out of their holdings. The new men who are rushing into the cattle and sheep business know nothing practically of their danger and hence can not be expected to be conservative. They expect to make fortunes in a short time, like the older and more experienced stockmen have, and may be safely depended on to abuse their ranges just as their predecessors did.

LACK OF INTEREST IN RANGE IMPROVEMENT.

Another serious difficulty in the way of a renewal of the ranges is the fact that not one stockman in ten has any scientific knowledge of grasses. He knows all about cows or sheep, but has never realized the necessity of studying the native grasses and their habits, and does not seem to care to know anything more about them than he now knows. At a meeting of stockmen recently held those present were questioned about the native grasses growing on their respective ranges. One of the best informed undertook to describe the habitat and the characteristics of certain varieties that were especially mentioned. In

ten minutes he had been frequently interrupted, in a pleasant way, by the others, his statements questioned, and his conclusions laughed at. Others undertook to explain, but they, too, failed to impress the meeting with the opinion that they understood the subject under consideration. At last one stockman offered a resolution which was adopted without a dissenting voice and with a shout. It was in words as follows: "*Resolved*, That none of us know, or care to know, anything about grasses, native or otherwise, outside of the fact that for the present there are lots of them, the best on record, and we are after getting the most out of them while they last."

The adoption of this resolution was followed by a good-natured discussion of the subject, during which those present demonstrated that they really did not know much about varieties, but became interested and were willing to do all in their power to assist in the preparation of a complete list of the grasses and forage plants of the region. Later, when as the result of less than one day's effort, nearly fifty distinct varieties of native grasses were found on one ranch, embracing less than 5 miles square, these men were prompt to admit their ignorance of the natural resources of the ranges. They will perhaps now take more interest in and better care of the grasses of their several holdings; but the rule as to others is likely to be, in the future as it has been in the past, to take things as they come and trust to the ranges to take care of themselves.

PERIODICAL DROUGHTS.

Although central Texas is not often subject to long periods of drought, such seasons have occurred, and may be expected again. If, during such dry years the ranges could be rested, there would be no serious lessening of their capacity for supporting stock. But judging the future by the past, they are not going to be so rested, and since during the droughty years they are more easily injured than at other times, such years present another serious difficulty in the way of a speedy renewal of the ranges. When there is little rain there is little grass, and little stock water. That means that stock are compelled to travel greater distances in search of food, and to and from water, from which results the trampling out of the grasses for several miles around each water hole. It is rarely if ever the case that even the close grazing of grass injures it, so long as the roots are not disturbed, but during the long doughts stock frequently pull up grass by the roots and in that way permanently injure the range.

ANIMAL PESTS.

The prairie dogs and jack rabbits are great pests on the range. People not familiar with them and their habits are apt to deride the idea that they can do very serious injury, but all stockmen understand that they can and do destroy a great deal of grass. One well-informed stockman says that "ten dogs can destroy grass enough every year to

support a cow." This may be an exaggerated estimate, but it is certain that the interests of stockmen demand the speedy extermination of these little animals. So far all efforts in that direction have been unavailing. As long as the State, counties, corporations, and non-resident individuals hold titles to considerable portions of the lands in the stock ranges, it is likely to be impracticable for any effectual remedy to be applied to the evil. It is quite possible for the dogs on a given section of land to be killed at small expense, but as long as those on the adjoining sections are not also killed, they will multiply and restock the sections temporarily freed from them. At every session of the Texas legislature bills are introduced looking to the State taking this serious matter in charge, but so far no bill that meets the demands of the situation has become a law. If the State would start in to kill the prairie dogs and jack rabbits on all the public lands, and force the owners of all other lands to do likewise, the benefit to the stockmen directly, and indirectly to the people of the State generally, would be very great.

PRICKLY PEAR.

Another factor that is tending to decrease the value of the ranges is the rapid spread of prickly pear and thorny shrubs over previously open country. Hundreds of square miles of the richest grazing country in southern Texas has been overrun with prickly pear, and the growth is each year becoming more impenetrable. In many of the southern counties it has been estimated that this cactus has already decreased the carrying capacity of the range one-fourth to one-third. The prickly pear is indeed a curse to the stock country. Some years ago, before cotton-seed hulls and meal were available as a fattening food, the pear was quite largely used after the spines had been disposed of by roasting or boiling. Now the cheaper and better cotton seed hulls, which do not require a like amount of labor in their preparation, have almost entirely displaced it as a forage. The fruits are produced in great abundance, and when ripe are eaten with evident relish by birds, hogs, and cattle, and the seeds are thereby being very rapidly disseminated over whatever country is still free from it. Not only does the pear increase from the seed, but if a joint of the stem is broken off and falls on the ground, it takes root and produces a new plant.

As a result of this rapid increase of prickly pear, the grass is being eaten to the roots wherever stock can get at it between the clumps of cactus. Paths are worn and the ground is trampled and packed, and the only grasses that are allowed to ripen seed are those growing within these thorny citadels of cactus plants. Cattle on the range will not eat prickly pear unless driven to it by hunger or thirst. It is a better substitute for water than for food, but with this statement of facts the best has been said concerning the forage possibilities of this plant. It is a fact that it is spreading every year over a wider extent of range country, and that its presence in any considerable quantity is on the whole detrimental to the best interests of stockmen.

HOW THE STOCK RANGES MAY BE RENEWED.

In considering the question of how the ranges may be renewed, the ideas and opinions of the leading stockmen have been solicited. Their suggestions as to the best remedial methods to be employed for bringing the land back to its primal stock-carrying capacity are here given.

NO MORE OVERSTOCKING OF THE RANGES.

There must be no more overstocking of the ranges. On the contrary, as far as practicable, the land must be rested systematically. Some of the leading stockmen of the section are now dividing up their holdings into winter and summer pastures, one being held exclusively for winter use, and no stock being allowed to go into it until after the grasses have ripened and shed their seed, the other being used for spring and summer grazing. An enterprising stockman of Mitchell County reports that in two years, under such treatment, he nearly doubled the capacity of a pasture of about four sections. Riding over this pasture, notes were made of the different varieties of grasses. About fifty were found, more than double as many as were growing on adjoining lands where his cattle were and had been running during the spring and summer months. The reasons for this are obvious, and the good sense of the plan is plainly apparent. This gentleman never allows his stock to run on any one pasture longer than for sixty to ninety days, when they are transferred to another. There is good reason to believe that by adopting this plan the pastures could in a few years be brought back measurably to their original capacity for supporting stock.

SELECTION OF THE BEST GRASSES.

But something further will be necessary than merely securing more grass or forage. Not only must the stock be given plenty of grass, but it must be the best quality of grass obtainable. In a collection of the native grasses of central Texas referred to the Division of Agrostology for determination there were many varieties that occur in great abundance all over the range country. Some have the appearance of being excellent grasses, although careful consideration of them demonstrates that they are not really valuable, because not relished by cattle. On the other hand, several varieties that did not look promising were found to possess very superior qualities. Quality rather than quantity should be the controlling idea. For instance, an acre of sedge (*Cyperus*) will produce more herbage than an acre of blue grama (*Bouteloua oligostachya*), but the latter will be worth much more than the former for pasturage. Of all persons the stockman should be the most interested and the best informed as to the relative feeding value of the grasses. He should study them carefully and fully, so that in the efforts he must constantly make to improve his range he will be in a position to secure the best results by taking care of and propagating only such varieties as will pay for the care and trouble.

PRESERVATION OF WATER SUPPLY.

One of the most serious mistakes made by the stockmen of the Southwest is that of not making ample provision for an abundant supply of stock water in anticipation of the periodical drought to which the region is subject. With a few exceptions the streams of the Southwest do not run continuously. In many of them the water runs only after rains, and all that is available for cattle is what is left in the deeper water holes. In good years, when the rainfall is up to or above the average and is distributed at intervals throughout the year, these chains of water holes in the river beds furnish enough water for stock purposes. But when the rainfall is below the average, and particularly when two or more dry years follow in succession, much suffering and loss are bound to result, if no other provision is made.

To obviate this deficiency, every stockman ought to build dams, tanks, or artificial ponds which may be filled by the natural drainage of the land back from the streams. Where the ground water is within reasonable depth, wells should be sunk and windmills put up. In many sections of Texas and eastern New Mexico artesian water may be secured.

If these precautions are not taken in years of plenty to provide against water famine in years of drought, the losses of stock will be very heavy. More is often lost during a dry year than can be regained in three or four good years. The loss is not confined to cattle alone, but there is also the permanent lowering of the carrying capacity of the range. When water is scarce cattle become weak, and although there may be excellent grass far back from the water holes, the stock congregate in their immediate vicinity, so that every sprig of grass is eaten off and the ground sometimes becomes trampled and bare for 3 or 4 miles in every direction. Dams or tanks can be provided at intervals of 5 miles over the range and all this destruction of valuable pasturage would then be prevented, as cattle would at no time be required to go more than 2½ to 3 miles for water, and they would naturally feed away from the water, where the best grasses could be found. Grasses that grow in wet lands have not the sustaining qualities of upland grasses, being more succulent and containing less of the fat-and-muscle-forming ingredients. Wherever water is abundant it will be found that cattle feed through preference on upland grasses far distant from the water, whereas if they have to travel from 10 to 20 miles for water, as is often the case during drought, they will stick close to the water and die of starvation rather than risk the chances of dying of thirst in the good grass country. If the carrying capacity of the ranges is to be increased, it is necessary that provision be made in advance against a scarcity of water in times of drought.

SUPPLY OF HAY AND FORAGE.

A herd of good cattle on a good range may and will, in all probability, thrive under favorable weather conditions. But there are seasons every few years in the southwestern range country when the range will not furnish sufficient nutritious food for stock. Many stockmen deride the view that cattle may not be able to do well all the year round on the range without other shelter than the scattering, stunted mesquite trees growing thereon, and without other food than that which they can pick up themselves. But they do not comprehend the situation. An early frost may any year seriously injure the quality of the range grasses. Winter rains may cause the mature grasses to rot, and so render them worthless as food for stock. A cow may manage to pull through the winter even on a range thus injured. And it is just possible that a longhorn may stand such treatment better even than a shorthorn. But to say nothing of the heartlessness of treatment that necessarily involves so much suffering on the part of stock, it pays to take the best possible care of the cattle at all times. During severe winters thousands of cattle and sheep die practically from starvation when 5 per cent of their value invested in hay or other proper food and fed to them through the winter would not only have saved their lives, but have brought them into the spring in healthy, growing condition. In the early history of central Texas there was no difficulty in securing first-class hay anywhere and everywhere. With the range renewed, this condition may be again attained. A careful study of the range grasses of the section and their systematic propagation will accomplish this purpose of supplying hay for winter use and forage for summer. It seems plain that this is the solution of the difficulty. Hence the suggestion is made that stockmen should without delay take the matter in hand. Further on in this report there will be described several of the grasses still to be found in this section that in past years were utilized for hay purposes. What has been done may be done again, and it is quite practicable for such grasses to be again used for hay to the great saving of cattle and other stock.

NATIVE GRASSES FOR HAY AND PASTURAGE.

Proper care must be exercised in the selection of the native grasses to be used for hay. Every year enormous quantities of baled hay are shipped into central Texas from other sections of Texas, and even from points outside of the State. This is all wrong, and should be, and may be remedied by the establishment and careful cultivation of hay meadows. Efforts have been made by some stockmen to grow alfalfa and other forage plants not native to the country. With irrigation alfalfa has done well, but it has been found impracticable to grow it successfully and profitably under other conditions in this section. Johnson grass is a great hay grass, and will thrive well without irrigation, but there are many objections to its extensive propagation, which

are so well known that they need not be enumerated in this connection. Australian saltbush has been sown, but so far without satisfactory results. Stockmen and others in and about Abilene, Tex., have experimented with the clovers, using seed obtained out of the State, and even Kentucky blue grass has been tried, but without satisfaction. Various forage plants, such as milo maize and the sorghums, have been and are still being grown to good advantage, but lands must be seeded down to them annually, and this involves no little labor and expense. What stockmen need are hay meadows of *native* grasses that have shown in past years all the best qualities of the best hay grasses elsewhere, and that do not require any experimental work to determine their adaptability and general value. Such an investment would be a paying one.

The Agrostologist of the United States Department of Agriculture reports that there are from 800 to 900 distinct varieties of grasses native in the United States. More than 25 per cent of these are natives of and are now growing in the State of Texas. There are many native varieties of the clovers also that doubtless will prove valuable for hay purposes. With such natural resources at their very doors, why should stockmen look to foreign countries or even to other sections of Texas for grass seeds and hay? In many countries of Europe, where every foot of land must be utilized in order to feed the people and their live stock, every sprig of grass that appears to be new is experimented with in the constant effort to find something of special value. Here, with so many varieties needing no experimental work to determine their value, we seem bent on destroying them as speedily as possible. While others in less-favored sections are developing one new variety we are systematically destroying a dozen quite as good. Let us take care of what we have and develop them. They are here now. They are here because the soil and climatic conditions are favorable. About the only question we have to determine is, Which of these are best for hay and which for grazing purposes? Then prepare and seed down lands with the best hay grasses and save the hay every year for winter use. This will add largely to the capacity of pastures for supporting stock, since stock fed on hay a part of every year will need less pasture grass, to say nothing of the advantage to the pastures of being allowed to rest periodically. The man who grows on his own place the feed for his own stock is the man who comes nearest to getting full value for his labor and investment. It is cheaper to send hay, milo maize, sorghum, and other forage to market in the shape of fat cattle, hogs, and sheep than in any other way. Moreover there are direct compensating advantages to the farm and ranch from returning to the soil the manurial qualities of the forage fed on them.

BENEFIT TO BE EXPECTED FROM RENEWAL OF RANGES.

It is estimated by those who have carefully examined the matter that about one-half of the acreage of central Texas is available for agricultural purposes, the other one-half being grazing lands. The territory recognized by that name is 100 by 200 miles in extent. This means 20,000 sections. The 10,000 sections considered as range lands contain 6,400,000 acres. If the statement previously noted is true, namely, that this section when first occupied might have supported 400 cattle on every section, the 10,000 sections would feed 4,000,000 cattle. To be conservative, suppose that in its early abundance the grass on every two acres would have kept one head of cattle, this would give 3,200,000 as the capacity of the region exclusive of agricultural lands. But it is estimated that, since the overstocking, 10 acres, on an average, are now necessary to the annual support of every head of cattle. This means that the 10,000 sections of grass land can now maintain, year in and year out, only about 640,000 cattle. Taking the fair average market value of the stock cattle of central Texas now at about $20 per head, the 3,200,000 which it has been estimated could have been sustained on these ranges in 1880 would be worth $51,200,000, while the 640,000 cattle—the present capacity of the range—are worth only $12,800,000, a decrease of $39,200,000 in the last twenty years. If the supposition is correct that it is yet practicable for the range throughout central Texas to be renewed to the extent of restoring it to its former capacity for maintaining stock, the above figures show the possible advantage that such a consummation would secure.

This condition of the range in central Texas represents very fairly the state of affairs in all the grazing regions of this country, excepting only those where the ranchman owns all the land or controls it under lease for a term of years. It is only when the stockman knows that it will be to his own financial interest to make improvements that efforts for the betterment of the range will be made.

There must first be stability in the control of the ranges before the necessary improvements that will bring back the old days of prosperity can be made. After this will follow better water facilities, winter shelter, hay, blooded stock, destruction of weeds and animal pests, the cultivation of the best of the native grasses and forage plants, and the introduction of new and improved sorts. There are many hundred thousand acres of land in the Southwest that will always be better adapted to stock raising than to anything else. With the use of the proper measures these ranges may continue for many years to be the finest grazing and breeding land on the American continent.

NATIVE GRASSES BEST FOR HOME USE.

From the list of well-known grasses and forage plants given further on, with details as to their respective merits or demerits, it ought not to be difficult for those interested in the renewal of the ranges through-

out central Texas and of the Southwest generally to select such as will fully meet the necessities of each case. Precisely how best to utilize them is not very certain, but several intelligent and well-informed ranchers who have been experimenting have offered suggestions in this direction worthy of consideration. One of them states that he has within the past three years very materially improved his range by a very simple method. A few years since, after a very long, dry spell of weather, being extremely apprehensive that his pasture might be burned, he plowed furrows across it every forty or fifty yards, each plowed strip being from 3 to 5 or 6 feet wide. His idea was that, like an ordinary roadbed, these bare strips might be of decided value as fire guards. Fortunately the range was not burned. By early fall the needles from the needle grass had blown over the pasture, and millions of them had planted themselves in the soft broken ground. Other grass seeds had also caught in this soft earth. The following spring and summer these furrows were thickly seeded down to a variety of grasses, principally the needle grass. From these seed beds the spaces between the furrows were largely reseeded, so that by the following summer he was able to note with satisfaction that his entire range had been much improved.

Another suggestion is that all the bare spots in the pasture should be harrowed or the crust otherwise broken and seed from the grasses known to be valuable should be systematically gathered and sown there before rains. It is believed that such spots can be covered with good grasses in a short time. The best grasses can in this way be distributed over the range, where they will in time contribute largely to the reseeding. Another stockman suggests that it is not necessary that furrows be run with plows through the range or that bare spots be harrowed or otherwise disturbed. His idea is that seed from the best grasses native to the section should be gathered and scattered about over the pastures, either when the ground is wet or when rain is anticipated. He predicts that in this way much can be accomplished in a few years toward the renewing of the ranges.

A farmer has still another plan to recommend which has been tried with good results, though on a small scale. He gathered the seeds of several varieties of grasses, known to be first class, and when there was a light snow on the ground scattered them over such parts of his pasture as in his opinion specially needed them. He is confident that the much-improved condition of the pasture is mainly due to this experiment.

Suggestions might be multiplied along this line, but quite a sufficient number have been offered to put those interested to thinking seriously about the matter. There was a few years since a most beautiful lawn in front of a residence in Abilene, Tex. The grass was less systematically and severely regulated as to the length each blade or stem was allowed to grow than was the case in the neighboring yards and lawns where

Bermuda grass was grown and lawn mowers were used. There was an old-fashioned look of vigor and variety about this grass that was pleasing. The owner explained that he had used a mixture of grass seeds secured from a seed dealer, and hence had many different varieties of grasses growing. The next year his lawn was not so attractive as when first noticed. He again explained that while the seed sown by him had apparently all germinated, and had, during an unusually wet spring and summer, grown nicely, the hard winter that followed had killed the roots of some, and the succeeding summer, which was dry and hot, had pretty well finished the others. Here was an object lesson which emphasized the suggestion that *native grasses are by far the best for home use; they are suited to the climate and the climate is suited to them.* If those interested will watch the habits of the native grasses carefully, they will soon be able to select the several varieties that will form the best combination for pasture purposes on the one hand and for hay on the other. In selecting those for pasturage the purpose should be to intermix the seed so as to secure the grasses that mature consecutively through the season. An early spring grass, such as the large needle grass (*Aristida fasciculata*), or the smaller needle grass (*Aristida arizonica*), to be followed by those that green out later, would prove a good combination, as it would secure a succession of grasses maturing at different times. But where the purpose is to cut the grass for hay the plan should be to sow together the seeds of those maturing at the same time. These questions will not be difficult to determine if those interested will watch their ranges and the habits of the grasses growing thereon, their time of flowering, and the ripening of the seed.

PROMISING GRASSES AND FORAGE PLANTS NATIVE IN THE SOUTHWEST.

There are 350 kinds of grasses in the State of Texas. Some of these are woodland and pine-land species from the eastern agricultural portion of the State. It is safe to say that the grazing part of the State possesses more kinds of nutritious grasses than any similar region in any country.

Of these a dozen require some brief characterization. They are the best of the grasses and forage plants, the ones which may profitably be brought into cultivation, and are the ones on which the ranchers will depend when they begin to collect seeds of the native grasses to cover the bare places in their pastures.

Bermuda grass (*Cynodon dactylon*) (fig. 1).—This native of the tropical and subtropical regions of the world was introduced into southern Texas sixty or more years ago, having been first planted near the mouth of the Brazos River. It has been distributed along the streams, and now covers many square miles of the best gazing lands of southern Texas. Its value is too well known to require further mention. However,

Bermuda grass can not be compared in its drought-resistant qualities with curly mesquite or buffalo grass, which it resembles in habit. It is better adapted to moist river banks, the borders of tanks, and low ground generally. Where the land can be irrigated, it is doubtful whether there is any grass which will furnish more or better grazing, but it is reported by a number of stockmen who have tried to seed down pastures to it that the curly mesquite will run it out in dry years. It

FIG. 1.—Bermuda grass (*Cynodon dactylon*).

does not produce seed in great abundance, and so must be propagated by division of the roots.

Black grama (*Hilaria mutica*) (fig. 2).—This is one of the most important grasses of the "staked plains" and of the country to the westward. It apparently does not extend eastward in Texas lower than 2,000 feet altitude. In former times this grass was abundant near Colorado City and Big Springs, Tex., and was cut for hay, which was highly valued by feeders to whom it was shipped in other sections of Texas; but the

grass is gradually being run out, because of overstocking and overpasturing. It is valuable especially as a winter forage, because the stems remain green long after the leaves have become entirely brown and dead. In this characteristic it resembles black grama (*Bouteloua eriopoda*) of New Mexico. It seeds abundantly whenever there is rain in the early part of the year. It is one of the most important grasses to use in the renovation of worn-out native pastures.

Buffalo grass (*Bulbilis dactyloides*) (fig. 3).—This is a perennial grass, that never grows high enough to cut, but which forms a beautiful, closely

FIG. 2.—Black grama (*Hilaria mutica*).

interwoven turf, with lateral, creeping root stocks bearing an abundance of leaves. It is one of the most nutritious of the prairie grasses, being equal in feeding value to the gramas, though not producing so large a quantity of forage. Buffalo grass and the curly mesquite are the most common of the Southwestern grasses. They spread rapidly either from seed or from turf divided and scattered in furrows. In a wet season this growth is extremely rapid. Buffalo grass will survive almost any degree of drying, trampling, and ill usage, making it one of the finest and most desirable kinds. Owing to the manner in which the

seed is produced it is practically impossible to harvest it, but because of the creeping habit of the grass it is one of the easiest to establish on the range, being propagated in the same way as Bermuda grass or curly mesquite.

Colorado grass (*Panicum texanum*) (fig. 4).—This rank-growing annual is undoubtedly a native of some of the western river valleys of Texas, either of the Colorado or some of its tributaries. It was first extensively brought to the notice of ranchers and farmers near Austin, Tex., in the bottom lands along the river where it appeared after a flood. Because

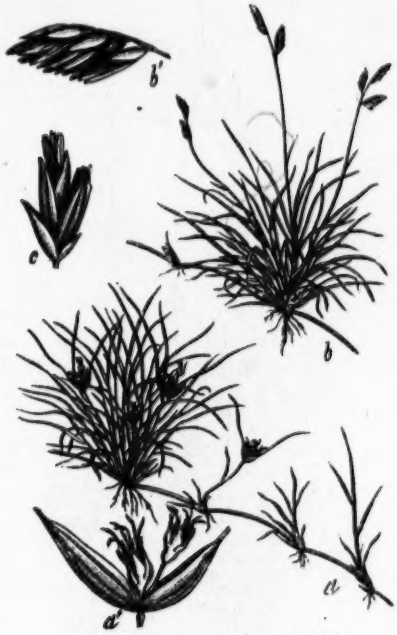

FIG. 3.—Buffalo grass (*Bulbilis dactyloides*).

of this, it has taken the name Colorado grass, Austin grass, or Concho grass. But whatever may be its origin, it is a very excellent species, and one of the best hay grasses on the black, waxy, prairie soils. When a field is seeded with it, it commences to spring up about the time the corn is cultivated for the last time, makes a rapid growth that quickly covers the ground. About the time the corn is ready to be gathered Colorado grass may be cut for hay. The farmers in the region where it grows are beginning to lay by their corn with special reference to this grass. It is regarded by the farmers of central Texas as the best of all their hay grasses. It requires cultivated ground for

its full development, and grows better on low, rich bottom lands and river valleys than on the uplands. Furthermore, it has not the weedy character of some other hay grasses, being easily destroyed in a single season if this is desired. Yields of 2 tons of hay per acre are not unusual, in addition to the crop of corn taken from the same field earlier in the season. It is an excellent substitute for Johnson grass, and deserves to be cultivated on a much larger scale.

FIG. 4.—Colorado grass (*Panicum texanum*).

Curly mesquite (*Hilaria cenchroides*) (fig. 5).—This is a turf-forming grass, which has the peculiar habit of creeping over the ground and rooting at the joints of the stems, from which spring leafy branches that in their turn reach out in every direction to take root. It commences to grow earlier in the spring than buffalo grass, makes a thick mat of rich feed during summer, matures on its roots, and in the fall and winter, when not rotted by late rains, affords excellent pasture for all classes of stock. It stands drought equally well with the gramas and buffalo grass, and is perhaps better adapted to the intense summer

heat of Texas and New Mexico than the latter. Buffalo hunters in the early days called it "southern buffalo grass," but it is now known as "curly mesquite." In very dry weather the leaves and stems dry up and look as though they were dead, but in a day after a warm rain it turns green to the end of its smallest blade. When cured on its roots stock fatten on it without grain. It may be compared with Bermuda grass in general appearance and manner of growth, but is far superior as a drought-resistant grass for general range purposes. Pas-

FIG. 5.—Curly mesquite (*Hilaria cenchroides*).

tures may be sodded down to it by harrowing in bits of chopped up turf in the early spring or by heeling in bits of turf after rain when the ground is soft. It rapidly spreads from these initial points, and in the course of a year will form a fine turf over the entire field. It is therefore one of the best grasses to be used in the renovation of the ranges.

Ground plum (*Astragalus crassicarpus*).—This is a perennial legume, which grows throughout the entire prairie region. It is well known on account of its fleshy plums or pods, which are produced in the greatest

abundance during the early spring months. The plant is eaten by cattle and sheep, and the fleshy pods are greedily sought for and devoured by hogs, which run at large in many of the counties of Texas and New Mexico. In fact, where hogs run free on the ranges this plant is being rapidly exterminated through its inability to ripen seed. It is very highly spoken of by stockmen, coming at a later period than the tallow weed, but before there is much grass. The forage is rich and is relished by all kinds of stock. There are several closely related spe-

FIG. 6.—Needle grass (*Aristida fasciculata*).

cies, which are all equally useful, and an effort should be made to prevent their complete extermination, at least until something equally good is found to take their places.

Needle grass (*Aristida fasciculata*) (fig. 6).—This grass has been looked upon quite generally by botanists and people other than cattlemen as very much of a nuisance, if not entirely worthless, but a careful inquiry conducted among the cattlemen shows that it is really one of the most valuable of the native range grasses. It is true that this grass is in some respects objectionable; the needles or ripe seeds and their long three-parted beards are sharp and brittle and cause much inconvenience when eaten by cattle, piercing their tongues and mouths and causing them to become sore. In the case of sheep the needles become

fastened in the wool and often penetrate the skin. This leads to much annoyance, and often causes loss, especially of lambs. However, the grass is not eaten by cattle when the seeds are ripe if there is enough other food. Needle grass is valuable, because it is almost the first to start growth in the spring, coming long before the curly mesquite or grama grasses have commenced to green out. Again, after the needles have fallen the wiry stems and leaves are eaten by all kinds of stock, so that it is one of the most valuable of the winter grasses. It is con-

FIG. 7.—Side-oats grama (*Bouteloua curtipendula*).

sidered as nutritious as the best, and there is no other grass that would entirely take its place at these two seasons of short feed—in early spring and in winter.

Side-oats grama (*Bouteloua curtipendula*) (fig. 7).—This is an excellent range pasture grass. It occurs widely distributed from Arizona to Montana and eastward throughout the Mississippi Valley, but it is in the southwestern portion of this territory that it reaches its fullest development and is of the highest importance. The stems grow from 18 inches to 3 feet tall, and make an excellent hay when well cured.

One of the best points about this grass is that it produces seed abundantly, and, if allowed to scatter its seed, will very quickly cover the range. It is one of the most promising species for increasing the carrying capacity of the southwestern ranges.

Stolley vetch (*Vicia leavenworthii*) (fig. 8).—This is an annual vetch, which grows in the granite region of central Texas and farther to the westward. It is especially valuable as an early spring forage plant, appearing before even the needle grass starts, thus supplying green food at a time when it is badly needed. It grows in great abundance

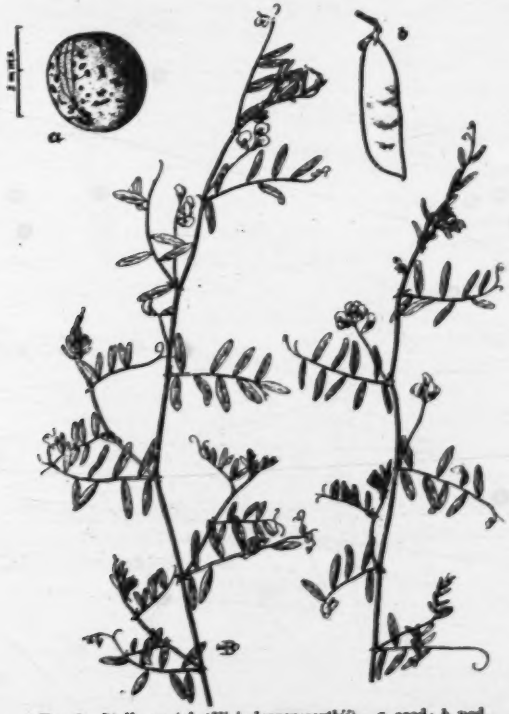

FIG. 8.—Stolley vetch (*Vicia leavenworthii*). a, seed; b, pod.

in Parker County, Tex., and has been experimented with under cultivation in Callahan and Burnet counties with most satisfactory results. It promises to be one of the best winter and early spring forage plants, and is valuable also as a soil mulch and green manure.

Tallow weed (*Actinella linearifolia*) (fig. 9).—Every sheep raiser in all the stock counties of Texas and New Mexico knows all about the value of this remarkable forage plant. It has somewhat the habit, when it first appears, of dandelion, and later puts out yellow blossoms on an upright stem from 9 to 15 inches high; still later it forms a seed head which somewhat resembles that of the yellow clover. The tallow

weed is a winter and early spring forage, which entirely disappears as soon as the seeds have ripened and fallen. The young plants commence to appear in autumn or midwinter, and grow during periods of bright weather all through the winter months. In January or February it commences to make more rapid growth and throws up its yellow blossoms. It is at this period that the plant is of great value. Sheep and cattle eat it with evident relish, and there is no forage which will fatten animals so quickly at the time just named as the tallow weed.

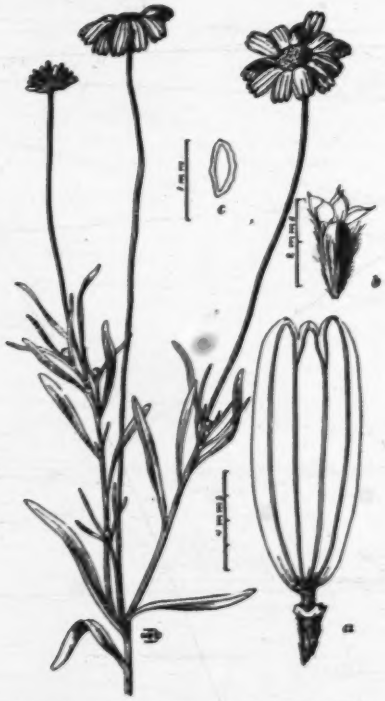

FIG. 9.—Tallow weed (*Actinella linearifolia*). *a*, ray-flower; *b*, seed; *c*, cross section of seed.

in fact, if it were not for the tallow weed there would often be no available grazing to carry stock through the critical period of early spring. So far as known, the tallow weed has never been cultivated, nor has any effort been made to extend its range by gathering the seeds and scattering them over new ground. Some such experiments ought to be made with it, as it is certainly a most excellent and nutritious forage plant.

Western wheat-grass (*Agropyron spicatum*).—This is a rather harsh-leafed grass, 20 to 30 inches tall. It grows abundantly from central New Mexico and Texas to the northern boundary of the prairie region.

It is highly valued by stockmen for its nutritive qualities, being relished by cattle whether cured as it stands on the range or cut for hay. It is one of the best drought-resistant grasses of this region, and occurs both in moist river valleys and on the drier uplands. It seeds freely every year, and is one of the best wheat grasses for use in bringing up the native pastures to their former value.

Blue grama (*Bouteloua oligostachya*).—This grass and the closely related black grama (*B. eriopoda*) are the most abundant and among the most nutritious of the range grasses. This grass is known throughout all the cattle-raising States from Montana and North Dakota southward to Arizona and the Mexican border. It grows well on the high arid plains and bench lands, and is both a hay and a pasture grass. Too high an estimate can not be placed upon its value for stock purposes. It seeds abundantly, and, as it often holds the ground to the exclusion of other species, seed could be obtained in large quantities at small expense by mowing and thrashing it out.

Wild bean (*Phaseolus helvolus*).—This species of bean and a dozen others closely related to it grow throughout the southwestern country. They are excellent stock foods, and when game was abundant in this region vast numbers of deer and antelopes are said to have fattened upon the wild beans and vetches that grew in the canyons and mountain ravines. Now the wild beans, like many other useful plants, are becoming very scarce, except in pastures which are not overstocked. The beans are like the cultivated pole beans in habit, forming long vines, climbing over weeds and bushes, and are sometimes nearly 50 feet in length. The forage corresponds in feeding value with the cultivated cowpea. These beans are mostly free seeders, and with a little care may become much more abundant than at present. They are perennials, with slender stems, large leaves, and, what is of the greatest importance, thick fleshy roots, which enable them to live through long rainless periods.

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These bulletins are sent free of charge to any address upon application to the Secretary of Agriculture, Washington, D. C.

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